RF Test Report

Product Name: **Remote Radio Unit**

Product Model: **RU3832**

Report Number: **SYBH(R)01486578EB-3**

FCC ID: **QISRU3832**

IC: **6369A-RU3832**

Reliability Laboratory of Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

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Notice

1. The laboratory has Passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.

2. The laboratory has Passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01.

3. The laboratory has been listed by the US Federal Communications Commission to perform electromagnetic emission measurements.

- The recognition number for the test site located in Shenzhen is 97456.
- The recognition number for the test site located in Shanghai is 684868.
- The recognition number for the test site located in Chengdu is 216797.

4. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements.

- The recognition number for the test site located in Shenzhen is 6369A, which contains 6369A-1 (3m chamber in G2), 6369A-2 (3m chamber in K3) and 6369A-3 (10m chamber in K3).
- The recognition numbers for the test site located in Shanghai is 6369D, which contains 6369D-1 (3m chamber) and 6369D-2 (10m chamber).
- The recognition number for the test site located in Chengdu is 6369E-1.

5. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

6. The test report is invalid if there is any evidence of erasure and/or falsification.

7. The test report is only valid for the test samples.

8. Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

Applicant:	Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Product Name:	Remote Radio Unit
Product Model:	RU3832

Date of Receipt Sample:	2014-08-20
Start Date of Test:	2014-08-20
End Date of Test:	2014-08-27

Test Result: Pass

Approved by Senior Engineer:	2014-09-17	Zhang Xinghai	Zhang Xing hai
	Date	Name	Signature

Prepared by:	2014-09-17	Li Guo	Li Guo
	Date	Name	Signature

Modification Record

No.	Last Report No.	Modification Description
1	---	First report.

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1 General Information

1.1 Applied Standard

Applied Rules:	47 CFR FCC Part 2 (10-1-13 Edition) 47 CFR FCC Part 27 (10-1-13 Edition) IC RSS-139 (Issue 2, February 2009)
Test Method:	FCC KDB 971168 D01 Power Meas License Digital Systems v02r01 FCC KDB 662911 D01 Multiple Transmitter Output v01r02 (if applicable) FCC KDB 662911 D02 MIMO with Cross-Polarized Antennas v01 (if applicable)

1.2 Test Location

Test Location 1 (TL1):	Reliability Laboratory of Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

1.3 Test Environment Condition

Temperature:	15 to 30 °C (Ambient)
Relative Humidity:	20 to 85 % (Ambient)
Atmospheric Pressure:	Not applicable

2 Test Summary

2.1 AWS Band (1710-1755 MHz paired with 2110-2155 MHz)

2.1.1 Measurement Technical Requirements

Test Item	FCC Rule	IC Rule	Requirements			Test Result	Verdict	Test Location
Transmitter Output Power	§2.1046, §27.50(d)	RSS-Gen,§4.8; RSS-139,§6.4; RSS-139,§4.1	FCC	Base Station / Fixed Station	● Average EIRP Power ≤ 1640 W (for EBW ≤ 1 MHz). ● Average EIRP PD ≤ 1640 W/MHz (for EBW > 1 MHz). ● PAPR ≤ 13 dB@0.1%.	Annex A	Pass	TL1
				Mobile Station / Portable Station	● Average EIRP Power ≤ 1 W. ● PAPR ≤ 13dB@0.1%.			
			IC	Base Station / Fixed Station	● Average EIRP Power ≤ 1640 W (for ChBW ≤ 1 MHz). ● Average EIRP PD ≤ 1640 W/MHz (for ChBW > 1 MHz). ● PAPR ≤ 13 dB@0.1%.			
				Mobile Station / Portable (hand-held) Station	● Average EIRP Power ≤ 1 W. ● PAPR ≤ 13dB@0.1%.			
Bandwidth	§2.1049, §27.53(h)	RSS-Gen,§4.6; RSS-139,§2.3	FCC	● OBW: No limit. ● EBW (-26 dBc): No limit.		Annex B	Pass	TL1
			IC	● OBW: No limit, may in lieu of EBW (-20 dBc).				

Test Item	FCC Rule	IC Rule	Requirements		Test Result	Verdict	Test Location
				● EBW (-20 dBc): No limit.			
Band Edges Compliance	§2.1051, §27.53(h)	RSS-Gen,§4.9; RSS-139,§6.5	FCC	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block. (EBW is -26 dBc EBW)	Annex C	Pass	TL1
			IC	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block. (EBW is -20 dBc EBW, or OBW)			
Spurious Emission at Antenna Terminals	§2.1051, §27.53(h)	RSS-Gen,§4.9; RSS-139,§6.5	≤ -13 dBm/1 MHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.		Annex D	Pass	TL1
Field Strength of Spurious Radiation	§2.1053, §27.53(h)	RSS-Gen,§4.9; RSS-139,§6.5	≤ -13 dBm/1 MHz.		Annex E	Pass	TL1
Frequency Stability	§2.1055, §27.54	RSS-Gen,§4.7; RSS-139,§6.3	FCC	● Test method: Fundamental emissions (Fc_meas) within the authorized bands of operation. ● Test conditions: (1) NV, -30°C/…/+50°C step=+10°C. (2) NT, ±15%*NV.	Annex F	Pass	TL1
			IC	● Test method: EBW (EBW_lower to EBW_higher) within frequency block. ● Test conditions: (1) NV, -30°C/+20°C/+50°C. (2) +20°C, ±15%*NV. (EBW is -20 dBc EBW, or OBW)			
Receiver Spurious Emissions	---	IC NOTICE 2012-DRS0126	---		Annex G	---	---

2.1.2 Non-measurement Technical Requirements

Description	FCC Rule	IC Rule	Requirements	Test Result	Verdict
Frequency Plan	§27.5(h)	RSS-139,§6.1	1710-1755 MHz paired with 2110-2155 MHz:	See technical specification description.	Comply

Description	FCC Rule	IC Rule	Requirements	Test Result	Verdict
					
Modulation Characteristics	§2.1047	RSS-139,§6.2	Any modulation.	See technical specification description.	Comply

3 Description of the Equipment under Test (EUT)

3.1 General Description

The RU3832 is an outdoor remote radio unit. It is the radio frequency (RF) part of a distributed base station and can be located near antennas. The RU3832 can modulate, demodulate, combine, and divide baseband and RF signals. It also processes baseband and RF signal data.

3.2 EUT Identity

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

3.2.1 Board

Board		
Board Name	Hardware Version	Description
WD5CIRAC10	Ver.D	Manufactured Board,WD5CIRXC40,Transceiver Board,2T4R,AWS,1*1

3.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
LMPT	LMPTc	HUAWEI	HERT BBU, WD22LMPT1, LTE Main Processing & Transmission Unit C(2*FE/GE RJ-45 or 2*FE/GE SFP), With M12M GPS Card

3.3 Technical Specification

Characteristics	Description	
Radio System Type	Single Radio Access Technology (Single-RAT):	☐ GSM ☐ UMTS ☒ LTE ☐ CDMA ☐ WiMAX
	Multi-Standard Radio (MSR):	☐ GSM & UMTS ☐ GSM & LTE ☐ GSM & UMTS & LTE ☐ WiMAX & LTE ☐ CDMA & LTE
Equipment Type	#1	☒ Base Station ☐ CPE (Customer Premises Equipment) Station ☐ Subscriber Station (User Equipment)
	#2	☒ Fixed Station ☐ Mobile Station ☐ Portable Station
	#3	☐ Indoor Station ☒ Outdoor Station
Supported Frequency Range	Transmission (TX):	2110 to 2155 MHz
	Receiving (RX):	1710 to 1755 MHz
TX and RX Antenna Ports	TX & RX port:	2
	TX-only port:	0
	RX-only port:	2
Multiple Carrier Supported	2	
Maximum RF Bandwidth	45 MHz	
TX Output Power	Max. 60 W (per antenna port) Max. 120 W (two antenna ports)	
Supported Channel Bandwidth	GSM system:	☐ 200 kHz
	UMTS system:	☐ 5 MHz
	LTE system:	☐ 1.4 MHz, ☐ 3 MHz, ☒ 5 MHz, ☒ 10 MHz, ☒ 15 MHz, ☒ 20 MHz
	CDMA system:	☐ 1.23 MHz, ☐ 1.25 MHz
	WiMAX system:	☐ 5 MHz, ☐ 7 MHz, ☐ 10 MHz
Modulation Type	LTE system:	Base-band: QPSK, 16QAM,64QAM Carrier: OFDM/OFDMA
Designation of Emissions (Note: the necessary bandwidth of which is the worst value from the measured occupied bandwidths for	LTE system:	4M52D9W, 9M02D9W, 13M5D9W, 20M0D9W

Characteristics	Description	
each type of channel bandwidth configuration.)		
Power Supply	Power Supply Type:	☐ External AC mains, ☒ External DC mains, ☐ AC/DC Adapter, ☐ Powered over Ethernet (PoE)
	Nominal Voltage, Input to EUT:	-48 VDC
	Voltage Range, Input to EUT:	-36 to -57 VDC
Antenna Assembles	Antenna Type:	☒ External ☐ Integrated
	Smart Antenna:	☒ MIMO ☐ Non MIMO
	Antenna Gain:	17.5 dBi (per antenna port, max.)
	Remark:	When the EUT is put into service, the practical maximum antenna gain may exceed the value as described above, and if exceed, the combination of the practical output power and the practical antenna gain should NOT exceed the required ERP/EIRP limit.

4 General Test Conditions / Configurations

4.1 Test Modes

NOTE: The test mode(s) are selected according to relevant radio technology specifications.

Test Mode	Test Modes Description
LTE/TM1.1	LTE system, 3GPP TS 36.141 clause 6.1.1, E-TM 1.1

4.2 EUT Configurations

4.2.1 General Configurations

Configuration	Description
Test Antenna Ports	Until otherwise specified, ● All TX tests are ONLY performed at the main TX antenna port (e.g. TRXA, TXA or similar) of the EUT, and ● All RX tests are ONLY performed at the main RX antenna port (e.g. TRXA, RXB or similar) of the EUT.
Multiple RF Sources	Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.

4.2.2 Customized Configurations

NOTE: For the carrier configurations, the description of “n*TxxxM(yyyW)@zzz” denotes the n * multiple carriers of the radio system type T (G - GSM system, U - UMTS system, L - LTE system, C - CDMA system, W - WiMAX system), for which the channel bandwidth of each carrier is xxx MHz (applicable for T supporting various channel bandwidths) and the power level of each carrier is yyy Watts, at the antenna port zzz (if specified). While the combinations of several “n*TxxxM(yyyW)@zzz”s denotes the carrier configurations of the MSR system.

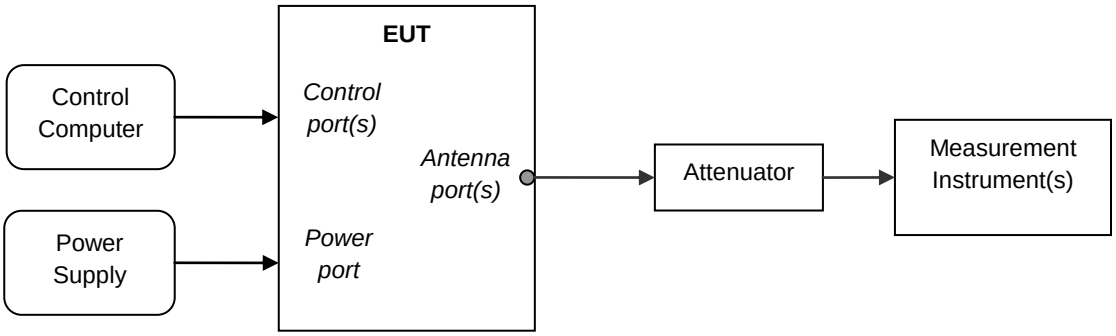
EUT Conf.	RF Ch.	Carrier Conf. Description	TX Freq. [MHz]	RX Freq. [MHz]	Ch. BW [MHz]	Power Level [dBm]	Test Mode
1L_5M_B	B	1*L(60W)	2112.5	1712.5	5	47.8	TM1.1
1L_5M_M	M	1*L(60W)	2132.5	1732.5	5	47.8	TM1.1
1L_5M_T	T	1*L(60W)	2152.5	1752.5	5	47.8	TM1.1
1L_10M_B	B	1*L(60W)	2115	1715	10	47.8	TM1.1
1L_10M_M	M	1*L(60W)	2132.5	1732.5	10	47.8	TM1.1
1L_10M_T	T	1*L(60W)	2150	1750	10	47.8	TM1.1
1L_15M_B	B	1*L(60W)	2117.5	1717.5	15	47.8	TM1.1
1L_15M_M	M	1*L(60W)	2132.5	1732.5	15	47.8	TM1.1
1L_15M_T	T	1*L(60W)	2147.5	1747.5	15	47.8	TM1.1
1L_20M_B	B	1*L(60W)	2120	1720	20	47.8	TM1.1
1L_20M_M	M	1*L(60W)	2132.5	1732.5	20	47.8	TM1.1
1L_20M_T	T	1*L(60W)	2145	1745	20	47.8	TM1.1
2L_5M_M	B	2*L(30W)	2112.5,2152.5	1712.5,1752.5	5, 5	44.8, 44.8	TM1.1

4.3 Test Environments

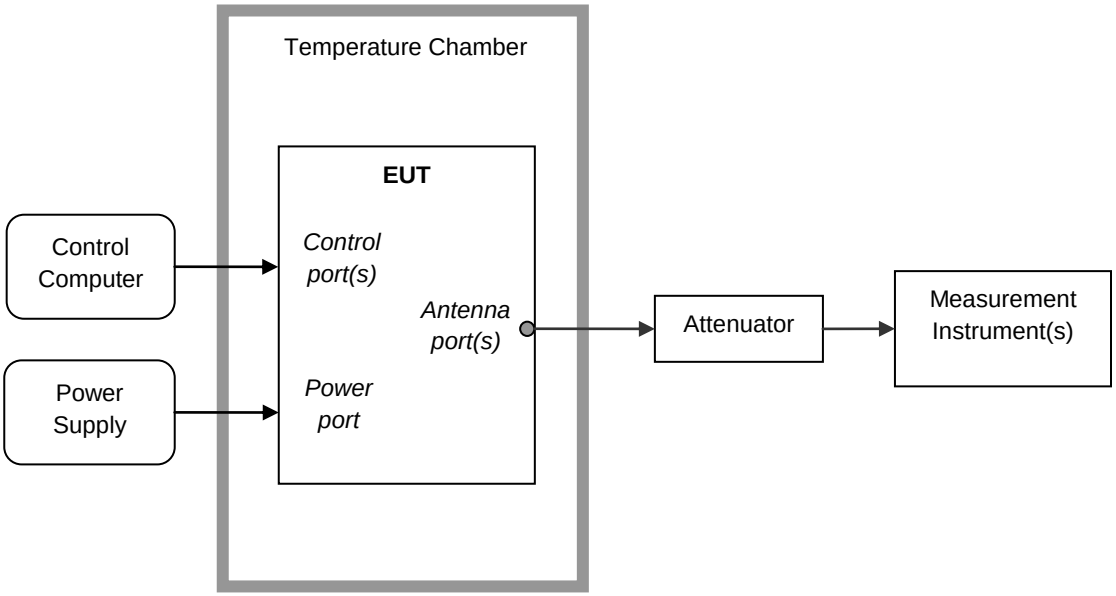
Environment Parameter	Selected Values During Tests		
	Temperature	Voltage	Relative Humidity
Ambient Climate	Ambient	---	Ambient
Rated Voltage	---	-48 VDC	---

4.4 Test Setups

4.4.1 Test Setup 1



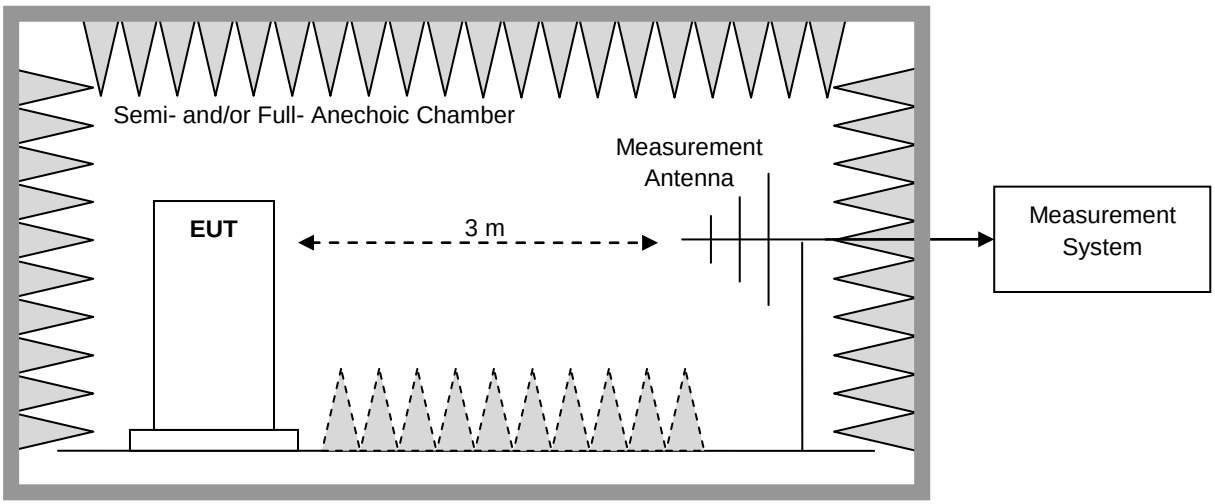
4.4.2 Test Setup 2



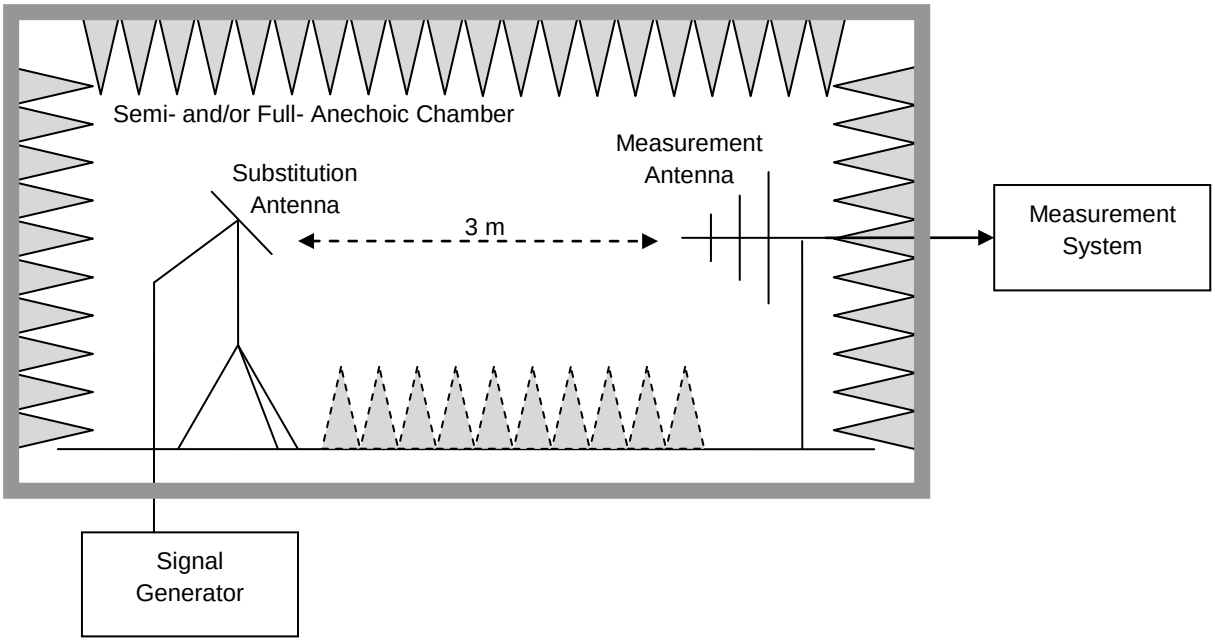
4.4.3 Test Setup 3

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

4.4.3.1 Step 1: Pre-test



4.4.3.2 Step 2: Substitution method to verify the maximum ERP



4.5 Test Conditions

Test Case		Test Conditions	
Transmitter Output Power	Channel Power, Total	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_B, 1L_5M_M, 1L_5M_T, 1L_10M_B, 1L_10M_M, 1L_10M_T, 1L_15M_B, 1L_15M_M, 1L_15M_T, 1L_20M_B, 1L_20M_M, 1L_20M_T, 2L_5M_M
	Power Spectral Density (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_B, 1L_5M_M, 1L_5M_T, 1L_20M_B, 1L_20M_M, 1L_20M_T
	Peak-to-Average Ratio (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_B, 1L_5M_M, 1L_5M_T
Bandwidth	Occupied Bandwidth	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_B, 1L_5M_M, 1L_5M_T, 1L_10M_B, 1L_10M_M, 1L_10M_T, 1L_15M_B, 1L_15M_M, 1L_15M_T, 1L_20M_B, 1L_20M_M, 1L_20M_T
	Emission Bandwidth (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_M, 1L_10M_M, 1L_15M_M, 1L_20M_M
Band Edges Compliance		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_B, 1L_5M_T, 1L_20M_B, 1L_20M_T, 2L_5M_M
Spurious Emission at Antenna Terminals		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	1L_5M_B, 1L_5M_M, 1L_5M_T, 1L_20M_B, 1L_20M_M, 1L_20M_T, 2L_5M_B, 2L_5M_M
Field Strength of Spurious Radiation		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 3
		EUT Conf.	1L_5M_M NOTE: If applicable, the EUT Conf. that has maximum power density (based on the equivalent power level) is selected.
Frequency Stability	Frequency Error	Test Env.	(1) -30 °C to +50 °C with step 10 °C at Rated Voltage; (2) 85%, 100% and 115% of Rated Voltage at Ambient Climate.
		Test Setup	Test Seup 2
		EUT Conf.	1L_5M_M

Test Case		Test Conditions	
			NOTE: A representative EUT Conf. was selected since the un-modulation carrier configuration was required by the standards/rules.
	Frequency Range (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 2
		EUT Conf.	--
Receiver Spurious Emissions		Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		EUT Conf.	--

5 Main Test Instruments

NOTE: Unless otherwise specified, the calibration intervals for test instruments were Annual (per year). The other intervals, if applicable, are marked with (##y), which denotes ## years calibration interval.

Equipment Name	Manufacturer	Model	Serial Number	Cal. Due
Test Setup 1 & 2				
Spectrum Analyzer	R&S	FSQ40	100025	2014-11-26
Spectrum Analyzer	Agilent	E4440A	MY49420179	2014-08-30
Climate Chamber	ESPEC	EW0470S	12113066	2014-12-25
Test Setup 3				
EMI test receiver	R&S	ESU40	100303/040	2015-01-12
Bilog antenna	Schaffner	VULB9163	9163-480	2015-05-10
Horn antenna	R&S	BBHA 9120	9120D-878	2015-03-20

6 Measurement Uncertainty

For a 95% confidence level (k = 2), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Test Item		Extended Uncertainty
Transmitter Output Power	Power [dBm]	U = 0.39 dB
Bandwidth	Magnitude [%]	U = 0.2%
Band Edge Compliance	Disturbance Power [dBm]	U = 2.0 dB
Spurious Emissions, Conducted	Disturbance Power [dBm]	U = 2.0 dB
Field Strength of Spurious Radiation	ERP [dBm]	For 3 m Chamber: U = 4.6 dB (30 MHz to 1GHz) U = 3.0 dB (above 1 GHz) For 10 m Chamber: U = 4.6 dB (30 MHz to 1GHz) U = 3.0 dB (above 1 GHz)
Frequency Stability	Frequency Accuracy [ppm]	U = 0.21 ppm

END